



Transition to lead-free ammunition benefits all

Jon M. Arnemo, Ruth Cromie, Anthony D. Fox, Niels Kanstrup,
Rafael Mateo, Deborah J. Pain, Vernon G. Thomas

Published online: 18 July 2019

The articles in this Special Issue demonstrate the continued adverse impacts on wildlife, humans, and the environment caused by lead in ammunition and fishing gear. They also show how, to date, actions to eliminate such impacts have been largely confined to the imposition of legal restrictions on the use of lead gunshot for hunting in some wetlands in some countries. The Special Issue concludes that such restrictions address only a subset of risks, often suffer from poor enforcement and compliance, that very few countries have taken fundamental steps to stop the use of lead ammunition and fishing gear, and that the complete and effective phase-out at the national level remains extremely rare. The mismatch between the demonstrable impacts of lead on wildlife, human health, and the environment and the effectiveness of measures taken to remove this avoidable source of pollution could not be starker. While the majority of papers in this Special Issue pertain to Europe, their findings and implications apply globally.

The goal of this Special Issue was not simply to define the problem but also to review solutions and most of the fifteen papers include management options. Understanding the issues, potential solutions, and impediments to their success are crucial in finding effective ways forward. It is our hope that the impact of the Special Issue will be enhanced through the inclusion and review of all of these areas.

The papers in this Special Issue demonstrate the extensive existing scientific understanding of the impacts of lead ammunition on wildlife and humans. Of particular concern is that lead exposure arising from shotgun and rifle shooting, and/or fishing gear, impacts or could impact large numbers of individuals, but also particular populations of waterfowl and scavenging birds, and that increased exposure to dietary lead through the frequent consumption of

wild-shot game presents risks to human health, especially to children and pregnant women.

Despite this substantial evidence base, there remains a need to communicate to a broad range of audiences the benefits that would accrue from the use of non-lead ammunition and fishing gear. These include: avoiding deaths of millions of wild animals from lead toxicosis, which would bolster natural populations and prevent considerable suffering; elimination of risks from ammunition-lead to the health of humans consumers of game; and an end to the annual increase in environmental contamination caused by these persistent lead products, with its concomitant toxic legacy. These benefits would promote the interests of hunters both directly, e.g., through the survival of more quarry animals, and indirectly, through stimulating a more positive public perception of hunting.

Evidence suggests that intransigence of some in the hunting communities and relevant industries, including denial of the scientific evidence upon which phasing-out of lead ammunition is advised, has inhibited progress at the socio-political level. Although such denial has certainly not been universal, evidence suggests that it has impeded progress. Successful transition to the use of non-lead ammunition and fishing weights requires that all sectors support evidence-based progressive policies and regulation at both national and international levels.

The Guest Editors and Project Group

Jon M. Arnemo, Ruth Cromie, Anthony D. Fox, Niels Kanstrup, Rafael Mateo, Deborah J. Pain, and Vernon G. Thomas

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Jon M. Arnemo

Address: Inland Norway University of Applied Sciences, Campus Evenstad, 2480 Koppang, Norway.
e-mail: jon.arnemo@inn.no

Ruth Cromie

Address: Wildfowl & Wetlands Trust, Slimbridge, Gloucestershire GL2 7BT, UK.
e-mail: ruth.cromie@wwt.org.uk

Anthony D. Fox

Address: Department of Bioscience, Aarhus University, Kalø, Grenåvej 14, 8410 Rønne, Denmark.
e-mail: tfo@bios.au.dk

Niels Kanstrup (✉)

Address: Department of Bioscience, Aarhus University, Kalø, Grenåvej 14, 8410 Rønne, Denmark.
e-mail: nk@bios.au.dk

Rafael Mateo

Address: Instituto de Investigación en Recursos Cinegéticos (IREC), CSIC-UCLM-JCCM, Ronda de Toledo 12, 13005 Ciudad Real, Spain.
e-mail: rafael.mateo@uclm.es

Deborah J. Pain

Address: Department of Zoology, University of Cambridge, David Attenborough Building, Pembroke Street, Cambridge CB2 3QZ, UK.
e-mail: pain.debbie@gmail.com

Vernon G. Thomas

Address: Department of Integrative Biology, College of Biological Sciences, University of Guelph, Guelph, ON N1G 2W1, Canada.
e-mail: vthomas@uoguelph.ca